

CLAIMS

1. A device functioning as an electric motor or actuator (100, 100') comprising:
 - a housing (110) encapsulating a rotating member (120, 120'),
 - 5 - one or several arrangements (130, 130') for generating a magnetic field due to electrical current,
 - a displaceable shaft (140, 140') at least partly having exterior grooves (141, 141'),
 - said rotating member having at least a portion (121, 121') with inner
 - 10 grooves (122, 122') substantially corresponding to grooves on said shaft (140, 140'),characterised by
at least one magnetic element (150, 150') arranged on an outer surface of said rotating member (120, 120') substantially perpendicular to extension direction
15 of said grooves (122, 122') for interaction with said arrangement (130, 130') and rotating said rotating member.
2. The device of claim 1, wherein said rotating element is a ball nut.
- 20 3. The device of claim 2, wherein said shaft is arranged as ball screw.
4. The device of claim 1, wherein said rotating element is a nut.
5. The device of claim 4, wherein said shaft is at least partly threaded.
- 25 6. The device of claim 2 or 4, wherein said nut on its outer surface is provided with a carrying sleeve for carrying said magnetic elements.
7. The device of claim 6, wherein said sleeve is provided with a flat portion and/or
- 30 grooves for receiving said magnetic elements.
8. The device of claim 7, comprising an air gap between said magnetic element and said sleeve.
- 35 9. The device according to any of preceding claims, wherein said shaft is made in sections of different parts.

10. The device of claim 9, wherein said parts are made of different material.
11. A device functioning as an electric motor or actuator (100) comprising:
- a housing (110) encapsulating a rotating member (120),
 - 5 - one or several arrangements (130) for generating a magnetic field due to electrical current,
 - a displaceable shaft (140) at least partly being arranged as a ball screw,
 - said rotating member having a portion (121) being provided as a ball nut,
- 10 characterised by
magnetic elements (150, 150') arranged on an outer surface of said rotating member (120') substantially parallel with extension of said shaft for interaction with said arrangement (130) and rotating said ball nut.
- 15 12. The arrangement of claim 11, wherein said outer surface of said nut comprises a sleeve for receiving said magnetic element.
13. The arrangement of claim 12, wherein said sleeve is made of a laminated material.
- 20 14. The arrangement of claim 13, wherein said shaft comprises ball return.
15. The arrangement of claim 14, wherein said ball return comprises a notch (6211) arranged diagonally on the ball nut (621), a preload system (6212), a return cap (6213) and a wiper (6214) arranged between the return cap and the shaft (6142), grooves or ball tracks (6141) in which the balls (6125) run.
- 25 16. The arrangement of claim 14, wherein said ball return comprises a single liner screw in which a notch (6211) forces balls (6125) passing through the notch to change track to the adjacent track.
- 30 17. The arrangement of claim 14, wherein said ball return comprises a ball nut having multi linear ball return.
- 35 18. The arrangement of claim 14, wherein said ball return comprises a single- or multi liner system, in which the balls are lead back after each circulation around

the shaft and the liner picks the balls out of a ball track and guides them with its path over the portion between the ball tracks of the shaft.

- 5 19. The arrangement of claim 12, wherein the shaft (9141) is provided with a return cap (9147) having a return channel (9148), wherein return cap system picks the balls up at one end of the nut and lead them back, through a hole in the nut, to the other side.
- 10 20. The arrangement of claim 14, wherein said ball return comprises a liner return (10142) placed in the shaft (10141) and the balls (10125) are lead through its path over a portion between the ball tracks (10122) of the nut
- 15 21. The arrangement of claim 11, wherein said shaft comprises means for transforming rotation of the nut to an axial movement.
22. The arrangement of claim 11, wherein said housing is at least partly filled with a lubrication agent.
- 20 23. A vehicle having steering wheels and including an actuator (100, 100') comprising:
- a housing (110) encapsulating a rotating member (120, 120'),
 - one or several arrangements (130, 130') for generating a magnetic field due to electrical current,
 - a displaceable shaft (140, 140') at least partly having exterior grooves (141, 141'),
 - 25 - said rotating member having a portion (121, 121') with inner grooves (122, 122') corresponding to grooves on said shaft (140, 140'),
- characterised by
- 30 magnetic elements (150, 150') arranged on an outer surface of said rotating member (120') substantially parallel with extension of said grooves (122, 122') for interaction with said arrangement (130, 130') and rotating said rotating member.
- 35 24. A method of actuating and object using a device functioning as an electric motor or actuator (100), comprising:
- a housing (110) encapsulating a rotating member (120),

- one or several arrangements (130) for generating a magnetic field due to electrical current,
- a displaceable shaft (140) at least partly being arranged as a ball screw,
- said rotating member having a portion (121) being provided as a ball nut,

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the method comprising the steps of:

arranging magnetic elements (150, 150') on an outer surface of said rotating member (120') substantially parallel with extension of said shaft for interaction with said arrangement (130) and rotating said ball nut, and energizing said

10 stators to rotate said rotating member and transforming rotation of said rotating member to a linear movement.